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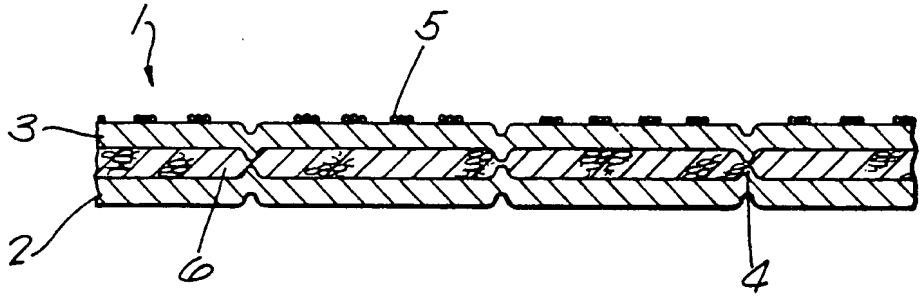
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(54) **Article suitable for wiping surfaces.**

(57) A sheet-like article (1) suitable for wiping surfaces comprising at least one substrate layer (2,3), the outer surface of which may be abrasive (5), and a core (6) comprising surfactant entrapped within a polymerisation product of a hydroxyalkyl α, β-unsaturated ester, the core (6) also contains a highly absorbent polymeric material.

Fig. 2.



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ARTICLE SUITABLE FOR WIPING SURFACES

The present invention relates to an abrasive article suitable for cleaning kitchen and bathroom surfaces without scratching. The article, which may for example take the form of a sheet, soonge or pad, combines mild abrasivity with the capability of delivering a cleaning agent in a controlled manner.

A wiping article having a "sandwich" structure, carrying a mild abrasive on one side and having a core of concentrated detergent is disclosed in EP 66 483B (Unilever).

According to the invention there is provided an article suitable for wiping surfaces comprising at least one substrate layer carrying a polymer material capable of absorbing and retaining at least 3g of hydrophilic liquid per gram of polymer, of releasing at least some of that liquid on the application of hand pressure, and of absorbing further liquid on the release of hand pressure, the article additionally comprising a polymerisation product of a hydroxyalkyl ester of an alpha, beta-unsaturated carboxylic acid and a surfactant, said surfactant being entrapped with said polymerisation product.

The outer part of the article that provides its wiping surfaces and gives the article its strength and integrity will be referred to hereinafter as the substrate. Examples of substrate materials include wet-strength paper, nonwoven fabric, woven and knitted fabrics, and natural and synthetic sponges. The substrate material must be flexible, permeable to water and of high wet strength, and is preferably reasonably absorbent and soft to the touch.

The inner part of the article, hereinafter referred to as the core, is completely surrounded by substrate material. The core of the article comprises a surfactant entrapped within a matrix material whereby the surfactant becomes controllably releasable, and a material capable of reversibly absorbing and expressing large volumes of liquid.

A preferred form for the article of the invention is a sheet-like laminate in which a core is sandwiched between two substrate layers. The substrate layers are bonded together around their periphery, and also at a sufficient number of other locations to hold them together in register: grid bonding as in EP 0 066 463B (Unilever) or point bonding as in EP 0 112 654A (Unilever) are both suitable. Bonding may be effected, for example, by means of heat-sealing or adhesive.

When the article is in the form of such a sheet-like laminate, the layers may be of the same material or of different materials. In a first preferred embodiment of the invention one carries an abrasive, while the other provides a soft absorbent surface.

Advantageously the abrasive is mild and comprises granules of a synthetic polymeric material, for example, polystyrene, polymethyl methacrylate or, above all, polyvinyl chloride. A high-molecular-weight (2 million) emulsion-polymerised polyvinyl chloride available from BDH Ltd has proved especially suitable. Other suitable polymeric abrasives are disclosed in US 3 382 058 (American Cyanamid). The particle size of the abrasive is generally at least 50 µm, otherwise the particles will penetrate into the substrate rather than remain on its surface. There is no definite upper limit on the particle size; in general, abrasivity increases with particle size, and so with a harsh abrasive large particle sizes should be avoided, but with the mild materials preferably used in the article of the invention quite large particle sizes, of the order of 1000 µm, may be present without scratching occurring. The choice of particle size may be constrained by the method used to apply the abrasive to the substrate, as discussed below.

The abrasive granules may be attached to the substrate by means of a suitable adhesive which is preferably of the latex type. Some suitable adhesives are listed in the aforementioned US 3 382 058 and also in US 3 451 758 (Procter & Gamble) and US 3 175 331 (Union Carbide Company). After curing, the adhesive should be elastic, flexible and resistant to deterioration on exposure to hot water and detergent compositions. It is especially preferred that the cured adhesive be slightly softened at hot-water temperatures so as to increase the flexibility of the article of the invention when it is in use; thus thermoplastic materials having a glass transition temperature below 50°C, preferably below 40°C and especially below 30°C, are preferred. Especially preferred adhesives are vinyl acetate homopolymers and copolymers, and thermoplastic acrylic polymers. Polyvinyl acetate, polybutyl methacrylate and styrene/butyl methacrylate copolymers all give good results. An example of a preferred material is the latex adhesive Vinamul (Trade Mark) 7172 ex Vinyl Products Ltd.

According to a second preferred embodiment of the invention, both substrates are abrasive but one substrate layer carries a harsher abrasive than the other layer. In use the more abrasive surface would be used initially to remove most of the soil from a surface to be cleaned and the cleaning process finished with the surface carrying the milder abrasive.

Preferably, in both the first and second preferred embodiments of the invention, the abrasive (mild or not) occupies not more than 70% of the area of the substrate surface. This means that the

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presence of even a harsh abrasive does not detract from the soft, flexible, cloth-like feel of the article. Preferably the surface coverage by abrasive is not more than 55%, a coverage of 25 to 50% being especially suitable. The harsher the abrasive, the lower the surface coverage should preferably be.

The adhesive and abrasive may be applied to the substrate by any suitable method, for example, dipping, impregnation, spraying or coating. To achieve the preferred partial surface coverage, printing methods are especially suitable, and screen printing is of particular interest.

Using screen printing the adhesive and abrasive may readily be applied in any desired pattern, for example, discontinuous parallel lines, a broken weave pattern, or a grid of continuous crossed lines. The thickness of the lines may be varied, to give differing abrasivities, by using printing screens of different dimensions.

For screen printing it may be necessary to add a thickening agent to the adhesive/abrasive dispersion in order to give a sufficiently viscous slurry. Suitable materials include polyvinyl alcohol, carboxymethyl cellulose, xanthan gum and gum arabic, and a preferred thickener is Viscalex (Trade Mark) HV 30 ex Allied Colloids. The dispersion also advantageously contains a coloured pigment so that a visually attractive printed pattern is obtained.

When the abrasive is applied by screen printing, it has been found that the maximum effective particle size of abrasive that can be used is about 250 µm; larger particles are simply filtered out by the printing screen. It appears, however, that with polymeric abrasives some agglomeration takes place during the printing process so that much larger particles (agglomerates) may be present on the substrate after printing.

The article of the invention is characterised by its core which, as indicated above, comprises a surfactant in controlled release form and a highly absorbent material.

Controlled release properties of the surfactant are achieved by entrapping it in a solid carrier material of matrix which is a polymerisation product of a hydroxyalkyl ester of an alpha, beta-unsaturated carboxylic acid. Materials of this class are capable of carrying relatively large quantities of surfactant and releasing it only when wetted and simultaneously subjected to a physical stimulus such as squeezing or rubbing.

Polymeric matrix materials of this type are disclosed in GB 1 522 759 (Airwick), and in EP 28 118B (Hydro-Optics Inc) and GB 2 061 308B - (Albright & Wilson). Of especial interest in the context of the present invention are materials of this type derived entirely from hydrophilic monomers, notably hydroxyethyl methacrylate and hydroxypropyl methacrylate. The latter material, which is available from BP Chemicals, is especially preferred.

The polymeric carrier or matrix material may be in any suitable form, for example, a single sheet, a sheet subdivided into small sheets, granules, powder or any other state of subdivision.

A polymer of this type containing a surfactant may be reduced to granule form with minimal loss of the surfactant and conveniently used in this form in the article of the present invention. When wetted and rubbed the article releases the surfactant in a controlled manner; the article can be left to dry and re-used at will until the surfactant is exhausted.

If desired the matrix material may contain other components, for example, perfume as disclosed in the aforementioned EP 28 118A and GB 2 061 308B, as well as a surfactant. Other components could also include bleach, disinfectant, polish, or any other useful household cleansing medium.

The article preferably contains from 2 to 10 g of the total matrix material, including the surfactant perfume and any other active ingredients present.

Surfactants tend to produce foam on wetting, so that excessive foaming can occur during rinsing out of the article, and use of the article to dry off a wiped surface can be problematic. The problem can be alleviated to some extent by the use of nonionic rather than anionic surfactant, but considerable foaming can still occur.

Preferred surfactants are the non-ionic detergents especially the polyethylene oxide condensates of aliphatic alcohols having 8 or more (e.g. 8-18) carbon atoms; such as lauryl or tallow alcohols combined with 3-30 moles of ethylene oxide for each mole of the long chain alcohol. Other preferred surfactants are the polyethylene oxide condensates of alkyl phenol having an alkyl group of 6 to 12 carbon atoms (e.g. nonyl phenol) in which up to 60 moles of ethylene oxide are combined with each mole of alkyl phenol. Highly preferred surfactants are Synperonic 7 (trade mark), Tallow alcohol 18EO , Tergitol 15-S-7 (trade mark) (secondary C_{11}-C_{15} alcohol 7EO), Dobanol 91-5 (trade mark) (linear C_9-C_{11} alcohol 6EO), and mixtures of Tergitol and Synperonic, tallow alcohol 18EO and Synperonic, tallow alcohol 18EO and Synperonic, tallow alcohol 18EO and Dobanol, and Nonylphenol 8EO.

The article of the invention contains in its core a polymeric material and is capable of reversibly absorbing and retaining large volumes of liquid. This material, the use of which in wiping articles has already been disclosed in GB 2 142 225A - (Unilever), is a pressure-sensitive porous polymer capable of absorbing and retaining at least 3 g, preferably at least 10 g, of hydrophilic liquid per

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gram of polymer, of releasing at least some of that liquid on the application of hand pressure, and of absorbing further liquid on the release of hand pressure.

The highly absorbent polymeric material is preferably a sulphonation product of a crosslinked polymer, for example polystyrene, containing sulphonatable aromatic residues and having a pore volume of from 3.0 to 99.5 cc/g. The sulphonatable cross-linked polymer is preferably a polymerisation product of a high (at least 90%) internal phase emulsion wherein the internal phase comprises water and the continuous phase comprises one or more monomers, preferably including styrene, and a crosslinking agent.

Other highly absorbent polymeric materials of use in the present invention include those disclosed in our co-pending British Patent Application No.8600102, and GB 2 155 481A (Unilever), EP 157 504 (Unilever), and EP 156 541 (Unilever).

The article preferably contains from 0.5 to 5 g of the highly absorbent polymeric material. This material not only substantially reduces the amount of foaming occurring when the article is rinsed and squeezed out, but also allows the article subsequently to be used to wipe dry a surface that had previously been cleaned wet. The article can then be rinsed again, squeezed out and allowed to dry for future re-use.

An article in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings, in which

Figure 1 is an isometric view of a wiping cloth in accordance with the invention, and

Figure 2 is a fragmentary section along the line II-II of Figure 1.

Referring now to Figure 1 and 2 of the accompanying drawings, a wiping cloth 1 consists of a lower substrate 2 and an upper substrate 3. The two substrates are bonded together using a thermoplastic bonding agent, along their edges and in a grid pattern 4 so as to form an array of square cells.

The upper substrate 3 carries a pattern of discontinuous lines 5, of abrasive.

The printed abrasive pattern has been shown only schematically. Possible patterns that could be used include discontinuous parallel lines (25% surface coverage), broken weave (50% surface coverage), or continuous crossed lines (50% surface coverage).

Between the substrates 2 and 3 is a core 6 consisting of a mixture of two different granular materials. The first of these consists of polyhydroxypropyl methacrylate matrix material carrying a surfactant. The second is a highly absorbent sulphonated polystyrene prepared as described in Example 1 of GB 2 142 225A (Unilever).

Example 1

A wiping article of the following composition was made;

Polymerisation Product	Weight %
Nonionic Surfactant (Nonylphenol 8EO)	34.8
Perfume	19.9
Polyhydroxypropyl methacrylate	44.7
Benzoyl peroxide (containing 25% water)	0.6

The first three ingredients were mixed and deoxygenated by bubbling nitrogen; the benzoyl peroxide was then added

and dissolved by shaking, and the mixture kept under nitrogen for 24 hours. The resulting block was coarsely broken into smaller pieces which were cooled in liquid nitrogen, hammer milled and sieved to give a material of particle size in the range 710-1000μ.

Porous Polymeric Material

A highly absorbent sulphonated polystyrene was having a particle size of 100 to 1000 μm prepared as described in Example 1 of GB 2 142 225A.

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Substrate

A layer of spun-bonded viscose non-woven fabric of base weight 60 g/m² having dimensions of 27 cm × 27 cm (Mitsubishi TCF 406 ex Mitsubishi, Japan) was printed with parallel discontinuous lines ca 420 µm high, covering 25% of the surface of the article, of the following composition:

Abrasive

Abrasive		Weight %
Polyvinyl chloride granules molecular weight 2 million, particle size 125-450 µm ex BDH Ltd		25
Vinamul 7172 (trade mark) adhesive ex Vinyl Products Ltd		40
Viscalex HV 30 (trade mark) thickener		4
Water, pigment	to	100

Assembly

5g of the polymerisation product and 2g of the porous polymer were spread evenly over the substrate layer and a layer of Mitsubishi TCF 406 of dimensions 27 cm × 27 cm placed on top of the polymers. The two substrates were bonded together using a thermoplastic bonding agent along their edges and in a grid pattern so as to form an array of twenty-seven 3 cm × 3 cm square cells.

Example 2

A wiping article similar to that described in Example 1 was made. It differed from the article described in Example 1 in the following features:

Polymerisation Product

10g of the following composition was used.

	Weight %
Nonionic Surfactant (Nonylphenol 8EO)	56.6
Perfume	5
Polyhydroxypropyl methacrylate	34.8
Benzoyl peroxide	0.6

Substrate

One substrate layer was coated with parallel discontinuous lines of abrasive ca 620 µm high.

Both of the exemplified articles were found to be highly effective for cleaning soiled kitchen and bathroom surfaces without scratching. On wetting, nonionic surfactant is released. After use, the article can be rinsed, squeezed out and used to dry off the cleaned surface, then rinsed and squeezed out again, allowed to dry and reused on a subsequent occasion.

Claims

1. An article suitable for wiping surfaces comprising at least one substrate layer carrying a polymeric material capable of absorbing and retaining at least 3g of hydrophilic liquid per gram of polymer, of releasing at least some of that liquid on the application of hand pressure, and of absorbing further liquid on the release of hand pressure, characterised in that the article additionally comprises a polymerisation product of a hydroxyalkyl ester of an alpha, beta-unsaturated carboxylic acid and a surfactant, said surfactant being entrapped within said polymerisation product.

2. An article as claimed in claim 1 wherein the polymerisation product is a polymerisation product of a hydroxyalkyl methacrylate.

3. An article as claimed in claim 2 wherein the polymerisation product is a polymerisation product of hydroxyethyl methacrylate or hydroxypropyl methacrylate.

4. An article as claimed in any one of the preceding claims wherein the surfactant is a nonionic surfactant.

5. An article as claimed in any one of the preceding claims wherein the surfactant is an ethoxylated aliphatic alcohol or an ethoxylated alkylphenol.

6. An article as claimed in any one of the preceding claims wherein the porous polymeric material is a sulphonation product of a cross-linked polymer containing sulphonation aromatic residues.

7. An article as claimed in any one of the preceding claims wherein the polymeric material has a pore volume of from 3.0 to 99.5 cc/g.

8. An article as claimed in any one of the preceding claims wherein the substrate comprises one or more layers of paper and/or nonwoven fabric.

9. An article as claimed in any one of the preceding claims wherein one or each substrate layer carries a layer of abrasive material on its outer surface.

10. An article as claimed in claim 9 wherein the abrasive material comprises a particulate material.

11. An article as claimed in claim 10 wherein the abrasive material has a particle size within the range of from 50 to 1000 µm.

12. An article as claimed in any one of claims 9 to 11 wherein the abrasive material is a synthetic polymeric material.

13. An article as claimed in any one of claims 9 to 12 wherein the abrasive material comprises polystyrene, polyvinyl chloride or polymethyl methacrylate.

14. An article as claimed in claim 12 or 13 wherein the abrasive material is held on the substrate layer(s) by a thermoplastic adhesive.

15. An article as claimed in any one of the preceding claims comprising a first substrate layer having an abrasive wiping surface, a second substrate layer having a soft, flexible absorbent surface suitable for buffing or wiping surfaces to dryness, between which are sandwiched a core comprising a surfactant entrapped within the polymerisation product of a hydroxalkyl methacrylate, and a polymeric material.

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Fig.1.

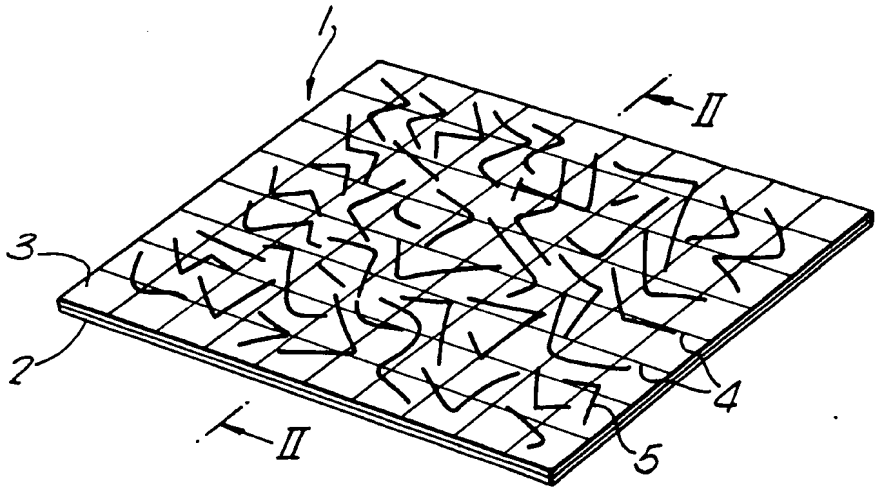
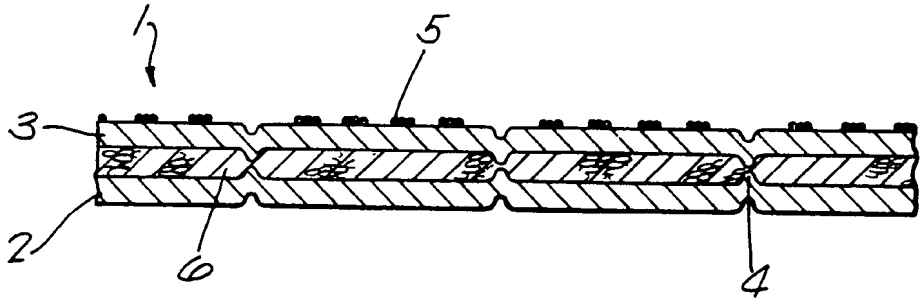


Fig.2.



European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 86306117.2

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	EP - A1 - 0 130 764 (UNILEVER) * Totality *	1-15	A 47 L 13/17
D,Y	GB - A - 1 522 759 (AIRWICK) * Totality; for the purpose of the polymer composition see espacially page 8, lines 29-35 *	1-15	
D,Y	EP - A1 - 0 066 463 (UNILEVER) * Claims 7,16,17,18,19,20,21 *	1-15	
A	GB - A - 1 245 242 (BRENNAN)	1	
A	GB - A - 2 130 965 (UNILEVER) * Totality *	1,8	TECHNICAL FIELDS SEARCHED (Int. Cl.4) A 47 L 13/00 A 47 L 17/00 A 61 L 15/00 B 32 B 7/00 C 11 D 3/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	17-11-1986	BEHMER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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